

1. (a) Show that S has a removable discontinuity at 0, where S is defined by

$$S(x) = \frac{\sin(x)}{x}.$$

Remember to state your conclusion in a sentence.

- (b) Based on the results of the previous part, a continuous function T can be defined where $T(x) = S(x)$ for x not equal to 0 but T is defined and continuous at 0. Define the function T and test both T and its derivative for continuity at $x = 0$ by using the 'iscont' command. What is the derivative of T at $x = 0$?
2. Find all values where the function R is not continuous by using the 'discont' command. Classify each discontinuity as infinite, jump, or removable. Justify your answers.

$$R(t) = \frac{t^3 + t^2 + t - 3}{t^3 - t^2 - 4t + 4}$$

3. Determine all values where the function f is not differentiable. Give the exact values and justify your answer.

$$f(x) = (x - 2)^{\frac{2}{3}} + \frac{3 \cos(x)}{x^2 - 2x - 4}$$

4. (a) Define the following two functions.

$$g(x) = \sqrt{(x+1)^2} \cdot \sqrt[3]{x^2 - 5x + 3} - 1 \text{ and } h(x) = \sqrt{(x+1)^2} \cdot \text{surd}(x^2 - 5x + 3, 3) - 1$$

Look at and comment on the output Maple gives you.

- (b) Use the 'iscont' command to test both g and h for continuity on the interval $(-\infty, \infty)$. Then use the 'discont' command to find any discontinuities of both g and h . Comment on the results.
- (c) Graph g and h (on separate graphs) using the plot *command*. (Don't use the plot builder.) Then, find a value in the region where the graphs differ and evaluate (and approximate) both g and h at that value.
- (d) Find where the derivative of h is discontinuous and classify the discontinuities of the derivative.